MISSOURI MONTHLY VITAL STATISTICS

Provisional Statistics

From The

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Focus. . . Neural Tube Defects and Folic Acid Awareness

One of the breakthroughs in birth defects prevention in the past twenty years has been the discovery that adequate levels of folate (folic acid) in the blood stream leads to a significant reduction in the chances of a pregnancy being affected by a neural tube defect (NTD). NTDs are associated with the failure of the bony casing that surrounds the spinal cord to fully close. Spina bifida and anencephaly are the most common names associated with these types of disorders. Spina bifida describes a condition where some portion of the spinal cord is not fully enclosed. Anencephaly is a much more severe defect where the bony casing covering the brain is missing. Studies have shown that risk for both defects are substantially reduced by taking appropriate levels of a folic acid supplement.

Although folic acid is naturally found in many fruits and vegetables, scientific research on the relationship between folic acid and NTDs so far has only involved synthetically designed folic acid supplements. Naturally occurring folate is subject to inactivation due to cooking and therefore may be less successful in preventing NTDs.[1] Folic acid is synthetically produced in most multi-vitamin supplements. Virtually all studies related to folic acid and NTD prevention have involved synthetic folic acid taken through a multi-vitamin or folic acid supplement. Current research is lacking on the differences between natural and synthetic folic acid and their potentially differing effects on birth outcomes.

Food fortification is another avenue by which women may increase their intake of folic acid. In 1998 the US Food and Drug Administration (FDA) required that all grains and cereals be fortified with folic acid. This has led to higher blood folate levels in all persons regardless of whether they take a vitamin supplement. But current studies show that food fortification by itself only brings the average woman's folic acid intake up to .3 mg, which is still below the .4 mg threshold that researchers believe for most women offers maximum protection against NTDs.[1] Based on the current research discussed above, the CDC recommends that women not rely solely on folic acid from dietary consumption, but rather take a folic acid supplement to obtain the best odds of reducing the risk of an NTD affected pregnancy. Because nearly half of all pregnancies are unplanned and because the neural tube develops within the first month of pregnancy when most women are unaware they are pregnant, it is recommended that all women capable of giving birth take the appropriate level of the folic supplement.

Health researchers have provided strong evidence that NTD-related pregnancies can be significantly reduced by women taking the recommended amount of a folic acid supplement.[1] For women who have never had an NTD-affected pregnancy, taking .4 mg of synthetic folic acid daily may prevent up to 50-70% of all NTDs. Women with previous NTD related pregnancies are at greater risk and are recommended by CDC to take 4.0 mg per day of folic acid.[1] A 1997 study in England and Wales that examined the effect of prenatal screening and subsequent terminations on NTD rates, attributed increased folate levels for approximately 50% of the

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decline in overall NTD rates.[2] Honein and colleagues looked at NTD rates in the US comparing pre- and post-fortification. They found a 19% decline in NTD rates from 1995 to 1999. They attributed most of the decline to increased folic acid intake[3].

With significant research providing evidence of the benefits of folic acid, the challenge then shifts to public health's role in getting the 'folic acid message' out to women who can most benefit from it. With that in mind, three folic acid questions were added to the Behavioral Risk Factor Surveillance System (BRFSS) survey for Missouri in 1999 in order to collect data on practices and perceptions concerning folic acid usage (through a multi-vitamin or folic acid supplement) among Missouri women aged 18-44. The BRFSS is an ongoing telephone survey that allows for analysis by socio-demographic, risk factor and health care access characteris-

Table 1

Missouri 1999 Behavioral Risk Factor Surveillance System: Statewide Weighted Percentage of Female Respondents in Each Indicator and Variable Category*, by Age.

Indicator	18-24 (n=247,852)	25-34 (n=364,724)	35-44 (n=428,240)	Total (n=1,040,816)
Total	23.8	35.0	41.1	100.0
Race Group				
White non-Hispanic	82.8	83.9	88.5	85.5
African American non-Hispanic	10.7	13.0	8.3	10.5
Hispanic and other	6.0	3.1	3.0	3.8
Data missing	0.5	0.0	0.3	0.2
Marital Status				
Single	66.6	32.8	26.7	38.4
Married	33.4	67.2	73.3	61.7
Data missing	0.0	0.0	0.0	0.0
Educational Level				
< High school	20.2	7.3	7.3	10.4
High school graduate	31.0	24.4	37.0	31.2
> High school	48.8	68.0	55.7	58.4
Data missing	0.0	0.2	0.0	0.1
Annual Household Income				
</= $14,999	31.4	11.7	9.9	15.6
$15,000-24,999	15.8	15.7	12.8	14.6
$25,000-49,999	35.6	40.7	39.6	39.0
>/= $50,000	7.8	23.2	30.1	22.4
Data missing	9.4	8.7	7.6	8.4
BRFSS Survey District				
Northeastern	5.0	4.0	3.9	4.2
Northwestern	5.5	4.0	3.8	4.3
Central	13.4	11.0	10.9	11.5
Southeastern	9.7	9.3	9.0	9.3
Southwestern	15.2	13.4	13.1	13.7
St. Louis metropolitan	32.9	37.6	38.8	37.0
Kansas City metropolitan	18.4	20.8	20.5	20.1
Data missing	0.0	0.0	0.0	0.0
General Vitamin Use				
Currently uses	43.5	59.9	56.2	54.5
No	56.5	40.2	43.4	45.4
Data missing	0.0	0.0	0.4	0.1
Folic Acid Use				
Currently uses	36.0	51.0	49.4	46.8
No	61.3	45.7	47.8	50.3
Data missing	2.7	3.3	2.7	2.9
Frequency of Folic Acid Use	*(n=89,093)*	*(n=185,842)*	*(n=211,729)*	*(n=486,664)*
Daily	*82.5*	*88.9*	*94.0*	*90.0*
Less than daily	*17.5*	*10.9*	*6.0*	*10.0*
Data missing	*0.0*	*0.2*	*0.0*	*0.1*
Reason for Folic Acid Use				
Make strong bones	21.3	15.0	21.5	19.1
Prevent birth defects	31.0	49.5	29.5	36.9
Other	21.4	13.6	20.3	18.2
Data missing	26.4	22.0	28.7	25.8

* The denominators are comprised of women aged 19-44 years.

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tics. Weighted response percentages for each characteristic and the three folic acid questions are presented in Table 1 by age group and total responses. Survey Data Analysis (SUDAAN) software was used to account for the sampling design. Ninety-five percent confidence intervals were calculated for the overall weighted response estimate for each characteristic as a gauge of significance. Significance, in this sense, can be defined in terms of the amount of variation from the overall response rate. The study attempted to measure how many Missouri women were taking a folic acid supplement, how often they were taking it, and why they were taking it. It also examined spatial variation in response to the questions at a regional level.

Overall, the survey showed that 46.8% of women aged 18-44 took a folic acid supplement. Table 2 summarizes data from a two part series of questions asking whether the individual took a folic acid supplement. It shows that younger women (aged 18-24) were significantly less likely to take a supplement. There was little difference in rates between the two older cohorts. There were however, some differences in folic acid use along race and ethnic lines. Females self-identified as white had about a 10% higher positive response percentage concerning folic acid usage compared to African-Americans and Hispanics. However, significance at the 95% confidence level could not be established due in part to the small sample size for the minority populations. Women with educational attainment at or below the high school level had a folic usage rate significantly below the state average. Household income also proved to be an indicator for the likelihood of taking folic acid. Women with household incomes above $50,000 were significantly more likely to take a folic acid supplement, while conversely, women in the lowest range (<$15,000) were significantly less likely to take a supplement.

Table 2

Folic Acid Supplement Usage By Select Demographic and Socio-Economic Factors

	Percent
All Persons	46.8
Age	
18-24	**37.1**
25-34	52.7
35-44	50.8
Race & Ethnicity	
African American	39.6
Hispanic	39.5
Educational Achievement	
Less than High School Diploma	**19.2**
High School Graduate	**39.1**
At Least Some College	**58.0**
Household Income	
< $15,000	**27.1**
$15,000- $25,000	43.8
$25,000-$50,000	52.2
> $50,000	**59.0**

* Numbers in bold indicate significance from the mean at the 95% confidence interval level

Source: Missouri 1999 BRFSS

Examined spatially (Map 1), some regional variations can be seen. The Northwest, Northeast, and Southeast regions were all below the state average for folic acid intake. The Northwest region was the lowest at 38.4%. The St. Louis metro region had the highest intake rate at 52.2%, although the difference from the state rate was not significant.

Map 1

Percentage of women who take a vitamin pill or supplement containing folic acid

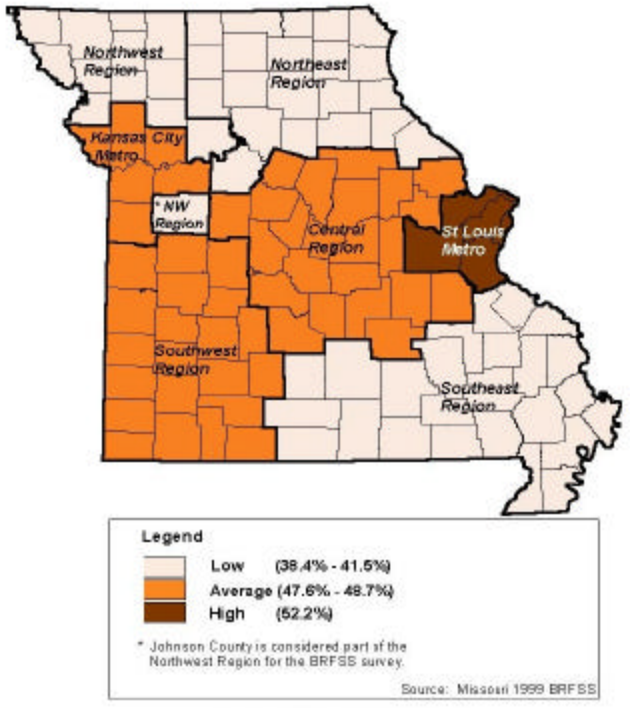

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Table 3

Percent of Folic Acid

	Percent
All Persons	90.0
Age	
18-24	82.5
25-34	89.1
35-44	**94.0**
Race & Ethnicity	
White	92.0
African American	82.7
Hispanic	53.6
Household Income	
< $15,000	84.7
$15,000- $25,000	92.0
$25,000-$50,000	89.4
> $50,000	89.9

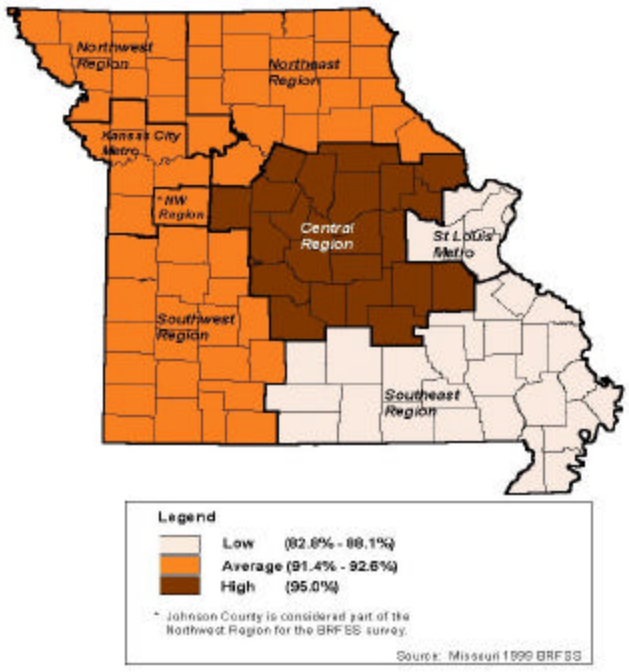
* Numbers in bold indicate significance from the mean at the 95% confidence interval level

Source: Missouri 1999 BRFSS

The second of the three primary questions on the BRFSS survey related to folic acid asked about the frequency with which women take folic acid. Of the women who reported taking a folic acid supplement, 90% took it daily. Examination by the same socio-demographic factors revealed only a few patterns. Table 3 shows that over 80% of both white and black populations took the supplement daily. The Hispanic sub-group had only a 53.6% response to daily folic acid intake. Again the small sample size of this sub-group may be the reason for the low outcome (there was no significant variation from the state average). Table 3 also demonstrates that older females (aged 35-44) were more likely to take folic acid daily. No trends were detected by household income while the educational data was not reliable enough to report. Geographically (Map 2), daily usage ranged from a low of 82.8% in the Southeast region to a high of 95.0% in the Central region. There were no significant differences by region from the state rate.

Map 2

Percent of Folic Acid Supplement (FAS) users who take a FAS daily



The final BRFSS question (see Fig. 1) attempted to determine the association women make between folic acid consumption and the prevention of birth defects. Overall, 36.9% of women identified preventing birth defects as the primary reason to take folic acid. Chart 1 shows the distribution of responses to the question by percent. While birth defects prevention was the top answer, the majority of women chose a different re-

Figure 1

Some health experts recommend that women take 400 micrograms of the B Vitamin Folic Acid for which of the following reasons:

A To Make Strong Bones
B To Prevent Birth Defects
C To Prevent High Blood Pressure
D Other
E Unknown

Overall, 36.9% of women ages 18-44 identified preventing defects birth as the primary reason to take folic acid.

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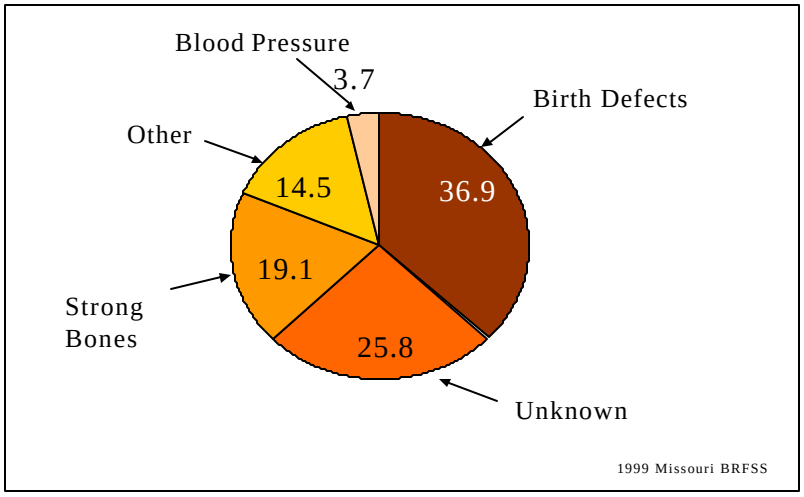
Chart 1

Breakdown of Responses Given as Reason for Taking a Folic Acid Supplement



sponse. Table 4 shows the response percentages (after removing unknown and invalid responses) by socio-demographic indicators. Significant differences in folic acid awareness were found based on age and educational achievement. Women age 25-34 were much more aware of the birth defects prevention benefits of folic acid than both younger and older women. The fact that younger women demonstrated a low level of awareness of the benefits of folic acid consumption highlights a need to find new and innovative ways to get the message out. It also shows that women with an educational achievement that included at least some schooling beyond high school were much more likely to choose the correct answer compared to those who did not. There was very little difference between women who had completed high school only and those who did not complete high school. Map 3 shows that the more urban areas were more likely to select birth defects prevention, while the rural areas in the north were less likely.

In summary, the survey indicates that folic acid consumption and education still have a long way to go in order to maximize the benefits of folic acid prevention. Most of the respondents reported not taking a folic acid supplement and most did not know that doing so could prevent birth defects. Younger women (ages 18-24) and women with only a high school education or less were significantly less likely than other women to engage in this practice or demonstrate this knowledge. Women

Table 4

Percent Who Indicate "Prevention of Birth Defects" as the Primary Reason to Take

	Percent
All Persons	49.6
Age	
18-24	41.7
25-34	**63.4**
35-44	**41.4**
Race & Ethnicity	
White	52.0
African American	34.9
Hispanic	32.8
Educational Achievement	
Less than High School Diploma	**30.4**
High School Graduate	**31.8**
At Least Some College	**60.0**
Household Income	
< $15,000	**30.7**
$15,000- $25,000	40.5
$25,000-$50,000	52.7
> $50,000	**63.5**

* Numbers in bold indicate significance confidence interval level

** Summary only includes valid responses unknown)

Source: Missouri 1999 BRFSS

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with a household income of less than $15,000 per year were also significantly less likely to take a folic acid supplement. Of the women who reported taking a supplement, 90% indicated that they did so every day. Among these women, it was those 35-44 that were significantly more likely to take a supplement every day. For all three-survey questions there was variation by race and ethnicity, with whites more likely to report the desired responses than blacks or Hispanics. However, the difference was not significant for any question. Similarly, there were no significant differences in the responses of urbanized women verses rural women for the three questions. However, women from the urban areas tended to give the desired response more often.

Note: The upper-bound response rate for the 1999 Missouri BRFSS is 68 percent. Response rate is based only on refusals, terminations and completed interviews.[4]

References:

1. Honebrink, Ann: Folic Acid and the Prevention of Neural Tube Defects. ACOG Clinical Review. 1999; 4(5): 1-14

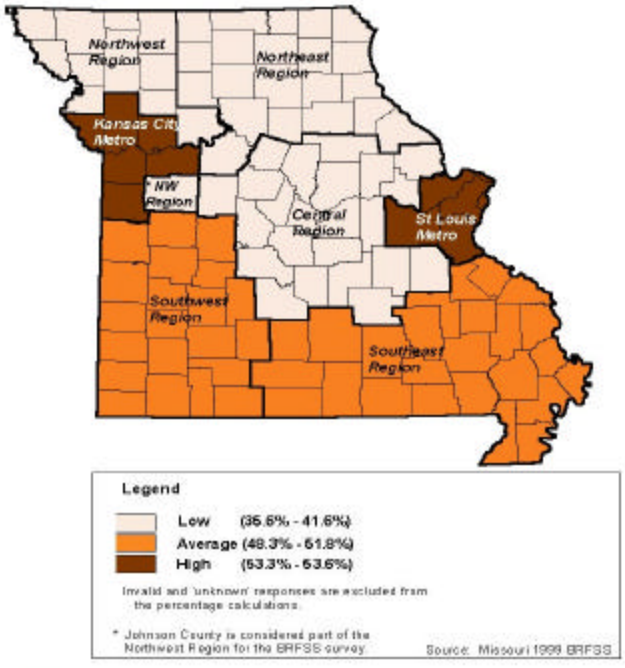
2. Morris, JK, Wald, NJ: Quantifying the Decline in the Birth Prevalence of Neural Tube Defects in England and Wales. J Med Screen. 1999; 6(4): 182-186

3. Honein M, Paulozzi L, Mathews MS, Erickson JD, Wong, LYC: Impact of Folic Acid Fortification of the US Food Supply on the Occurrence of Neural Tube Defects. JAMA. 2001; 285 (23): 2981-2986

4. 1999 BRFSS Summary Quality Control Report. (http://www.cdc.gov/brfss/ti-quality.htm)

Map 3

Percentage who indicated 'prevention of birth defects' as the primary reason to take folic acid*



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Provisional Vital Statistics for December 2001

LIVE BIRTHS decreased in December as 6,177 Missouri babies were born compared with 6,320 one year earlier. Provisional calendar year 2001 births decreased by 1 percent to 75,529 from 76,320 in 2000.

DEATHS decreased in December as 3,670 Missourians died compared with 4,068 in December 2000. Cumulative deaths for the 12 months ending with December 2001 decreased slightly from 54,602 to 54,327.

The **NATURAL INCREASE** in December was 2,507 (6,177 births minus 3,670 deaths). The provisional 2001 natural increase of 21,202 was down 2.4 percent from 2000's count of 21,727.

MARRIAGES increased in December as 2,283 Missouri couples married compared with 2,052 one year earlier. Cumulative marriages went up slightly in 2001.

DISSOLUTIONS OF MARRIAGE decreased in December from 2,329 in 2000 to 1,854 in 2001. Cumulative dissolutions for the 12 months ending with December also decreased.

Missouri **INFANT DEATHS** increased in December as 40 infants died compared with 34 in December 2000. The cumulative infant death rate for the 12 months ending with December increased from 7.2 to 8.0 per 1,000 live births. The 2001 rate is slightly inflated due to irregular reporting.

PROVISIONAL RESIDENT VITAL STATISTICS FOR THE STATE OF MISSOURI

Item	December				12 months ending with December								
	Number		Rate*		Number				Rate*				
	2000	2001	2000	2001	1998	1999	2000	2001	1997	1998	1999	2000	2001
Live births	6,320	6,177	13.6	12.5	75,242	75,366	76,329	75,529	13.6	13.7	13.6	13.6	13.4
Deaths	4,068	3,670	8.8	7.4	54,849	55,732	54,602	54,327	9.9	10.0	10.0	9.8	9.6
Natural increase	2,252	2,507	4.8	5.1	20,393	19,634	21,727	21,202	3.6	3.7	3.5	3.9	3.8
Marriages	2,052	2,283	4.4	4.6	43,865	44,369	43,665	44,016	8.0	8.0	8.0	7.8	7.8
Dissolutions	2,329	1,854	5.0	3.8	25,305	24,583	24,980	24,893	4.7	4.6	4.4	4.5	4.4
Infant deaths	34	40	5.4	6.5	573	588	547	604	7.6	7.6	7.7	7.2	8.0
Population base (in thousands)	...	...	5,595	5,630	...	...	...	...	5,452	5,499	5,547	5,595	5,630

*Rates for live lirths, deaths, natural increase, marriages and dissolutions are computed on the number per 1000 estimated population. The infant death rate is based on the number of infant deaths per 1000 live births. Rates are adjusted to account for varying lengths of monthly reporting periods.